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Designing a European extraterrestrial sample curation facility



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Curating NASA's Past, Present, and Future Astromaterial Sample Collections

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The Astromaterials Acquisition and Curation Office at NASA Johnson Space Center (hereafter JSC curation) is responsible for curating all of NASA's extraterrestrial samples. JSC presently curates 9 different astromaterials collections in seven different clean-room suites: (1) Apollo Samples (ISO class 6 + 7); (2) Antarctic Meteorites (ISO 6 + 7); (3) Cosmic Dust Particles (ISO 5); (4) Microparticle Impact Collection (ISO 7; formerly called Space Exposed Hardware); (5) Genesis Solar Wind Atoms (ISO 4); (6) Stardust Comet Particles (ISO 5); (7) Stardust Interstellar Particles (ISO 5); (8) Hayabusa Asteroid Particles (ISO 5); (9) OSIRIS-REx Spacecraft Coupons and Witness Plates (ISO 7). Additional cleanrooms are currently being planned to house samples from two new collections, Hayabusa 2 (2021) and OSIRIS-REx (2023). In addition to the labs that house the samples, we maintain a wide variety of infrastructure facilities required to support the clean rooms: HEPA-filtered air-handling systems, ultrapure dry gaseous nitrogen systems, an ultrapure water system, and cleaning facilities to provide clean tools and equipment for the labs. We also have sample preparation facilities for making thin sections, microtome sections, and even focused ion-beam sections. We routinely monitor the cleanliness of our clean rooms and infrastructure systems, including measurements of inorganic or organic contamination, weekly airborne particle counts, compositional and isotopic monitoring of liquid N₂ deliveries, and daily UPW system monitoring. In addition to the physical maintenance of the samples, we track within our databases the current and ever changing characteristics (weight, location, etc.) of >250,000 individually numbered samples across our various collections, as well as >100,000 images, and countless "analog" records that record the sample processing records of each individual sample. JSC Curation is collocated with JSC's Astromaterials Research Office, which houses a world-class suite of analytical instrumentation and scientists. We leverage these labs and personnel to better curate the samples. Part of the curation process is planning for the future, and we refer to these planning efforts as "advanced curation". Advanced Curation is tasked with developing procedures, technology, and data sets necessary for curating new types of collections as envisioned by NASA exploration goals. We are (and have been) planning for future curation, including cold curation, extended curation of ices and volatiles, curation of samples with special chemical considerations such as perchlorate-rich samples, and curation of organically- and biologically-sensitive samples.

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